



Transportation

Homeland Security

Serious Gaming

Military

V M A S C

**Education in modeling
& simulation**

**Medical modeling
& simulation**

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‘Modeling & Simulation Vision 2020’

**policies & programs for
growth & success**

Agenda

Political Sector – Federal & State

Economic Development

Academics & Workforce Development

Research & Development

Technology

M&S Vision 2020 – What if...

Federal government establishes a national M&S task force which writes a national M&S strategy for M&S as an industry and discipline

National & inter- (federal) agency M&S standards are established and adopted for:

- architectures, protocols, data, lexicon & semantics, and VV&A**
- math-science-engineering-physics-based M&S**
- behavioral models with HITL involving culture, humanities & social sciences (HSS).**

The National Academies officially recognizes M&S and establishes a M&S academy

Congress passes legislation mandating use of M&S in all branches of federal govt for:

concepts exploration

requirements analysis

use of executable architectures for modeling & testing systems and process functions

analysis of alternatives and evaluation of metrics (MOE, MOP, cost etc)

prototype & input / output modeling

system process and lifecycle modeling

workforce training and development

M&S Vision 2020 – What if...

Every state in the Nation has established a M&S Advisory Council.

Collectively, these councils form a national advisory council for M&S.

M&S academic programs, K-20, have been established in all states to:

**support both STEM and humanities,
provide workforce development;**

All states and regions have conducted M&S economic impact studies

State governors and legislatures mandate the use of M&S as mentioned above (see national) plus urban planning, emergency management, transportation, etc.

All states have passed legislation that streamlines transfer IP from universities to industry.

Internet II and Lambda Rail available throughout the nation.

Partnerships in place between labs & academia, industry and government to

- research**
- develop**
- deliver solutions**

M&S Vision 2020

Political National & State Initiatives

Modeling & Simulation Centers



M&S Graduate Programs: UCF, NPS, ODU

April 2006:

**M&S Congressional
Caucus submits letter
to the President on
Modeling & Simulation**

July 2007:

**HB487. U.S. House of
Representatives establishes
M&S as a national critical
technology**

Fall 2007:

**HR 4137. Sec. 886 Cong.
Bobbie Scott provides \$40M
plus-up for M&S higher
education programs**

Winter 2008:

**HR 4321. Bill sponsored by
Cong. Randy Forbes
establishes medical M&S
program**

COMMITTEES:
ARMED SERVICES
SUBCOMMITTEES:
READINESS
TACTICAL AIR AND LAND FORCES

JUDICIARY
SUBCOMMITTEES:
COURTS, THE INTERNET, AND INTELLECTUAL PROPERTY
CRIME, TERRORISM, AND HOMELAND SECURITY
COMMERCIAL AND ADMINISTRATIVE LAW

SCIENCE
SUBCOMMITTEE:
SPACE AND AERONAUTICS



J. Randy Forbes
United States Congress
4th District, Virginia

April 26, 2006

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The Honorable George W. Bush
The White House
Washington, D.C. 20500

Dear Mr. President:

I am writing to you to follow up on the discussion we had during our meeting on March 29, 2006 about Modeling and Simulation and the recent Modeling and Simulation Leadership Summit. Your declaration of Modeling and Simulation as a "National Critical Technology" essential to U.S. world economic leadership would be a significant step toward advancing your science and technology agenda.

Modeling and Simulation has allowed us to create a degree of jointness among our armed services not otherwise possible. It is providing the capability to train our troops and offering the predictive analysis to keep them safe. While this technology grew out of the Department of Defense, it is now exploding in the areas of medicine, construction and urban planning. Most of all, next to NASA, it is the greatest magnet attracting young people to math and science in the world today.

As Chairman of the Modeling and Simulation Caucus in the U.S. House of Representatives, I would like to share with you some of the outcomes of the Modeling and Simulation Leadership Summit conducted on February 6, 2006 in Suffolk, Virginia.

With an audience of approximately 350 members of industry and government, the Summit underscored the importance of the Modeling and Simulation industry to the economic productivity of our nation. Modeling and Simulation certainly keeps within your emphasis on science and technology as the basis of maintaining and growing America's competitiveness in international markets.

Modeling and Simulation is the single most powerful tool available to support our nation's international competitiveness in a wide variety of economic sectors. It is clear that an effective and diverse national industrial infrastructure already exists to advance this industry.



State M&S Initiatives (Virginia)

1997. Commonwealth establishes Virginia M&S Center (VMASC) at ODU

2005. VA JCOTS (Joint Commission on Technology and Science) creates an advisory committee for M&S (Del. John Cosgrove)

2006. VA House Bill 134. Streamlines transfer of intellectual property (IP) from higher education universities to industry (Dels. Cosgrove & Purky)

2006 & 2007. Legislature (Del. Joe May) sponsors legislation that mandates the use of M&S for 2 state transportation projects

2007. VA House Bill 2030 (Del. John Cosgrove). Establishes a VA M&S Advisory Council to the Governor, cabinet & legislature.

2008. Legislature (Del. Chris Jones). HR194 mandates the use of M&S to analyze 6 transportation alternatives - \$4-5B in state transportation projects.

Federal & State Programs & Policies

Federal

- ▼ Nat'l M&S Strategy.
 - Formulate a comprehensive, multi-agency national M&S strategy
 - DoD, DHS, DOE, NIH, DOJ, FBI, CIA, DOT, FAA, Agriculture, Education, Etc.
- ▼ Renew SBIR program.
 - Provides small businesses with boost
 - Helps to incubate the M&S industry
- ▼ Establish M&S NAICS category
- ▼ National M&S Standards.
 - Form national task force to establish M&S standards
 - Reps - academia, national labs, federal & state agencies, and industry
 - Stds: architectures, protocols, data, lexicon, v&v

State

- ▼ Develop State M&S Strategies
- ▼ Establish State M&S advisory councils
 - Membership – govt., industry, academia, political sectors
 - Advise state/local govts on M&S initiatives, investments, issues.
 - Advocate for federal & federal funds.
 - Advocate for M&S education, transportation, emergency management programs
- Economic impact studies

M&S Vision 2020

Economic Development

1



SDDC-TEA

Military Surface Deployment
and Distribution Command
Transportation Engineering
Agency

2



NASA

National Aeronautics and
Space Administration
Langley Research Center

3



USAF

Air Combat Command

4

Jefferson
Lab

5



TRADOC

Training and Doctrine
Command

6

USJFCOM
Norfolk

United States Joint Forces
Command

14

FCTC

Fleet Combat Training Center
Atlantic Dam Neck

CDSA

Combat Direction Systems
Activity

13

Maintenance
& Logistics

U.S. Coast Guard

12

Old Dominion
University

11

Atlantic Area
Command

U.S. Coast Guard

MS&V TECHNOLOGY CUSTOMERS IN HAMPTON ROADS VIRGINIA



7

Joint Forces
Staff College

8



ACT

Allied Command
Transformation

10

JWFC
Suffolk

United States
Joint Warfighting Center

9



VMASC

Virginia Modeling, Analysis
and Simulation Center



VMASC
The discipline of M&S™

Partnerships – the Key to M&S Success

(teaming agreements, CRADA, SAA, etc.)

Industry – ‘big, mids & smalls’

International & Federal

- ACT & NATO
- DoD (CRADA)
 - JFCOM
 - Services
- NASA (Space Act Agreement)
- DHS, Natl Labs, NIH, etc

State

- Technology
- Transportation
- Office of Preparedness,
- Education
- Commerce & Trade

Local / Regional (Hampton Roads)

- HRP, HRRP, HREDA, HRPDA
- Municipalities: Suffolk, Norfolk, VA Beach, Hampton, Chesapeake, Portsmouth
- South Central VA, Eastern Shores, Richmond

Academia: Nat'l & Int'l

- Virginia: ODU, W&M, NSU, HU, TCC, TNCC, EVMS, UVA, VA Tech, GMU, VCU, EVMS
- Nat'l: NPS, CMU, UAH, TAMU, USMA,
- Int'l: Sweden, South Korea

Assess the Economic Impact of M&S (HR)

Factor	2004	2007	% Change
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2004 - REMI Model Version 5.5

Total Output	\$412.9M	\$639.5M	+54.9%
Regional Product	\$248.0M	\$408.1M	+64.4%
Employment	4,023	5,092	+26.6%
Average Salary	\$60.2k	\$82.7k	

2007- REMI Model Version 8.0

Total Output	\$258.4M	\$364.6M	+41.1%
Regional Product	\$167.3M	\$237.8M	+42.1%
Employment	3,524	4,420	+25.4%
Average Salary	\$60.2k	\$82.7k	

- ▼ 2004 – REMI Ver. 5.5 – Standard Industrial Classification (SIC) codes.
- ▼ 2007 – REMI Ver. 8.0 – North American Industrial Classification System (NAICS)
- ▼ Direct comparison (2004 vs 2007) not possible - industry classifications do not match
- ▼ Neither SIC or NAICS specify M&S as unique professional category.
- ▼ Significant M&S growth & economic impact in non-DoD sectors – but its hard to measure it in new markets w/o a M&S category code.

Secure Grants to Grow M&S Clusters

EDA Grant

- \$750K grants available from Federal Economic Development Agency to promote M&S.
- In Hampton Roads - Grant funded through Hampton Roads Partnership (HRP). Effort led & administered by Hampton Roads Research Partnership (HRRP)
- \$200K to VMASC to promote M&S clusters in medical, transportation, education & serious gaming

Wired Grant – \$5M (\$1M/year for 5 years) for HR for economic development

M&S Vision 2020

Academic Programs & Workforce Development

Promote M&S STEM Education Initiatives

- ▼ Organize and host STEM Education Workshops
- ▼ Work with local high schools to advance the use of MS&G and GBL
- ▼ Promote and apply for NSF Proposals:
 - “Games to Prevent Gaps” to promote STEM curriculum using GBL
 - “Game Based Studio” focused on game development to promote M&S career interest



Host Summer M&S Camps for high school and rising freshman and females (MSE) to familiarize them with MS&G

- ▼ Work with Foundations: Northrup Grumman / Beasley Proposal for Teacher Boot Camps. Focus on helping teachers to bring games into classroom.

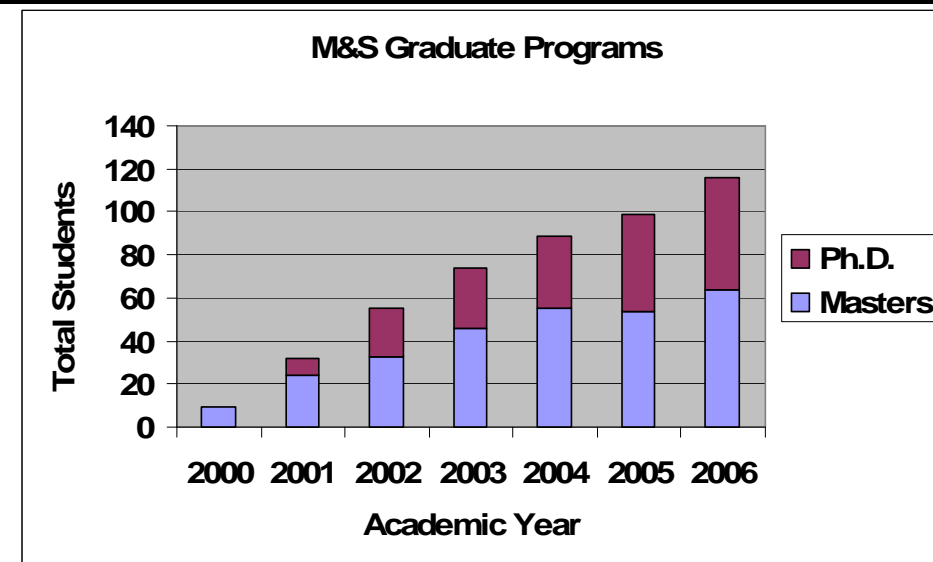


Grow Academic Programs (VMASC)

- ▼ 3 universities offer M&S graduate degrees: NPS, UCF, ODU
- ▼ ODU/VMASC Grad Pgm
 - Masters 1998 (MS & ME)
 - Ph.D. 2000
 - All courses offered via DL
- ▼ 2009 - ODU to offer Nation's 1st undergrad M&S program

- ▼ 2 M&S Area of Emphasis – 6-8 courses
 - Psychology
 - Education
- ▼ 6 Certificate Pgms. (minor) – 4-6 courses
 - Mathematics, physics, computer science, health sciences, business, international studies (social sciences)

Masters				
Intro to M&S	Intro to Discrete Event Simulation	Engr Systems Modeling	Analys I	Visuali- zation I
PhD				
	Continuous & Real-time Simulation	Simulation Formalism	Analys II	Visuali- zation II





STUDENT CAPSTONE CONFERENCE

MODELING, SIMULATION, & GAMING

The Capstone Conference

The Virginia Modeling, Analysis and Simulation Center (VMASC) of Old Dominion University is hosting the 2008 Modeling, Simulation, & Gaming Student Capstone Conference on April 10. The Conference features students from the ODU Modeling and Simulation Graduate Program and universities and schools across the country. Students will present their research to an audience of fellow students, faculty, judges, and members of the VMASC Board of Advisors.

For the students, these presentations serve as a culmination of their research and academic careers. The Conference affords them the opportunity to present their findings to members of the modeling and simulation community in academe, industry, and government. Each Presentation Track is assigned judges who select the top three projects for each track. These winners will receive awards at the Capstone Banquet the evening of April 10th.

If you are interested and would like to invite your students to participate, please send an email to cmbanks@odu.edu.

There is a \$25.00 registration fee for each person attending the conference.

Student Submissions – Call for Papers

GRADUATE STUDENTS are required to submit a 250 word abstract and a paper 6-8 pages in length. Students should be the primary authors of the paper. Papers must be unpublished and not currently submitted for publication.

UNDERGRADUATE STUDENTS may do poster or annotated PowerPoint presentations. Undergrads are required to submit a 250-word abstract of the presentation. Undergraduate students who wish to submit a paper must follow the requirements as outlined for the Graduate students. The deadline for submissions is February 28, 2008.

When: April 10, 2008

**Where: Old Dominion University
Virginia Modeling, Analysis, &
Simulation Center**

**Who: Undergraduate & Graduate
Students**

www.vmasc.odu.edu/capstoneconference.htm

Presentation Tracks

Transportation	Medical	Education/Game-based Learning	M&S in Engineering
Discipline of M&S	HomelandSecurity/Military M&S	General Sciences	



informatics

SAIC
An Employee-Owned Company



LOCKHEED MARTIN



WernerAnderson



Business & Workforce Development

Federal & State - Small Business Boost

- ▼ Provide small business with “Incubator-like” support
 - Office Space
 - Internet & Phones
 - Copier/Printer access
 - Conference rooms
 - Administrative Support

Grow M&S Simulation Courses

Modeling and Simulation

Educating the DoD Communities and Services



Acquisition; Test and Evaluation

M&S Conferences

- ▼ Support M&S conferences
- ▼ Increase participation by expanding scope of M&S conferences beyond DOD

Educating the Acquisition and
T&E Workforce in the More
Effective Use of M&S:
Market Schema

Training Levels
Executive
Management
Application
General Awareness

Acquisition Career Fields

Program Management
Systems Engineering
Test and Evaluation
Contracting
Logistics
Facilities Engineering
Auditing
Science & Technology
Information Technology
Business, cost estimating, and financial mgmt
Industrial and/or contract property management
Manufacturing, production and quality assurance
Purchasing





HAMPTON ROADS
Research Partnership



MODSIM World

Conference & Expo Decision-Making in Complex Operating Environments Using Modeling & Simulation

September 16-18,
2008

Virginia Beach,
Virginia
USA

Virginia Beach
Convention Center

For complete info &
registration:

www.modsimworld2008.com

■ ENGAGE

...with world M&S leaders from industry, government,
academia.

■ DISCOVER

...how emerging M&S technology trends can be applied to solve
organizational and decision-making problems.

■ LEARN

...how to apply M&S technology to your specific organizational
needs and transfer M&S knowledge to your employees.

SIX TRACKS

HEALTH &
MEDICINE

HOMELAND
SECURITY

EDUCATION/
TRAINING

ENGINEERING
& TECHNOLOGY

TRANSPORTATION
& LOGISTICS

DEFENSE

CROSS-CUTTING TRACK: GAME-BASED TECHNOLOGY

**The cross-cutting track applies to each of the 6 focal tracks*

Conference participants will gain an understanding of how modeling and simulation can be used as a tool to enable more effective organizational decision-making as well as provide solutions to complex problems.

(See Available Sponsorship Programs on Back)



EASTERN VIRGINIA
MEDICAL SCHOOL

BREAKAWAY
Ltd.

HAMPTON
ROADS

PARTNERSHIP



NORTHROP GRUMMAN



VMASC
VIRGINIA MODELING, ANALYSIS, AND SIMULATION CENTER



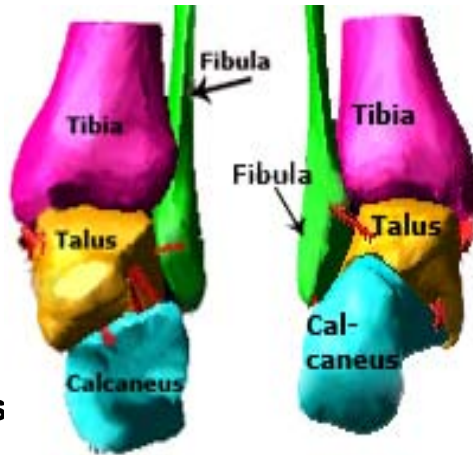
M&S Vision 2020

Research & Development

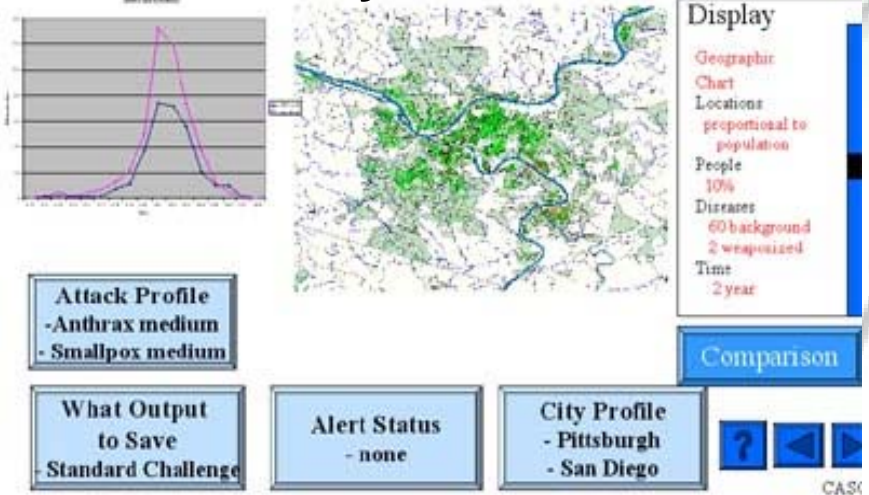
Medical M&S

Patient Specific Models

- Models will be developed to treat trauma and diseases effecting organs and joints such as the ankle joint on a patient specific basis



Mass Casualty Models



- Virtual Operating Rooms
- Instrumented Training Environments
- Joint partnerships & projects with civilian & military medical schools
- M&S Train & certify medical personnel on procedures and as a team

Game Based Learning & STEM

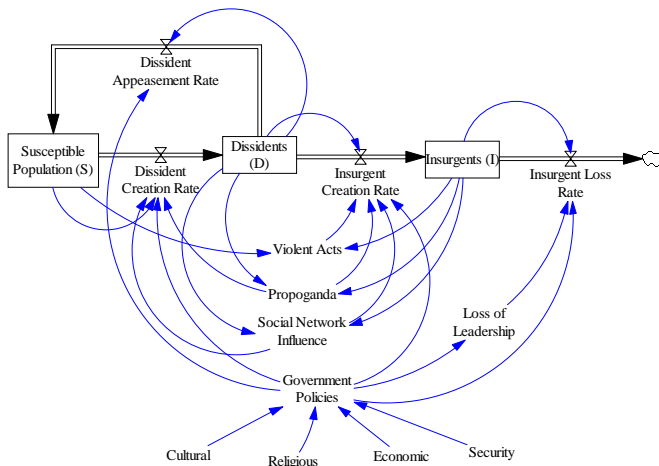
- ▼ To create a synthetic learning gaming environment that is captivating and motivating, and delivers relevant learning experiences for both education and training
- ▼ Develop culturally relevant, historically accurate games for training and education that include a foreign language component
- ▼ GBL with embedded principles, techniques and procedures that provide users with a practical learning and training experience contributing to workforce development
- ▼ STEM initiatives for K-20
- ▼ Humanities & Social Sciences.
- ▼ Games for Entry Level Training
- ▼ Games for medical rehabilitation & mentally / emotionally challenged.



DoD, DHS, DOT, Emergency MGT

Critical Infrastructure Modeling

- ▼ Model critical infrastructure in complex urban environments for disaster mitigation and recovery.
- ▼ Understanding conditional dependencies and interactions among critical infrastructures is important to understanding cascading effects and mitigation effects.



Social Networks Modeling

- ▼ Model social groups such as insurgencies and irregular warfare.
- ▼ Model crowds and crowd behaviors
- ▼ Model human behaviors dealing with population dynamics, social networks, and human behaviors.

M&S Vision 2020

(One) Technology Challenge

M&S Vision 2020 – One Tech Challenge

- Mid-1980s: TRS 80, 8K memory
- Today: Pentium, 500GB RAM, storage in MEGS or GIGs
- Scale
 - Byte
 - Kilobyte
 - Megabyte
 - Gigabyte
 - Pentabyte
 - Terabyte
 - Exabyte (2 to the 60th bytes)

▪ Illustrative Example

1 typed page = 2K

Shakespeare Works = 5
MEG

1 pickup full = ~1 GIG

1 EB = 1 billion pickup
trucks

Last year ~ 160 EB created
& copied

- 160 EB = 3M x number of books ever written
- Challenge - Internet bandwidth consumed by 2010

(Source: Bret Swenson, Fellow,
Discovery Institute)



**Thanks for your service
to our Nation**